

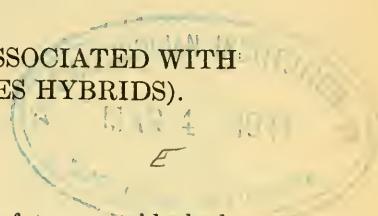
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PROCEEDINGS
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NEMATODES PARASITIC ON AND ASSOCIATED WITH
ROOTS OF MARIGOLDS (TAGETES HYBRIDS).

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In 1933 an examination of the plants of two outside beds located between the greenhouses of the U. S. Department of Agriculture in Washington, D. C., revealed that of the various ornamentals grown there the following 19 were infested with the root-knot nematode, *Heterodera marioni* (Cornu 1879) Goodey 1932:

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| <i>Acalypha virginica</i> L. | <i>Impatiens balsamina</i> L. |
| <i>Alsine media</i> L. | <i>Iresine lindenii</i> Van Houtte =
(<i>Iresine lindenii</i> Lem.) |
| <i>Amaranthus (caudatus?)</i> var. Sunrise | <i>Lobelia erinus</i> L. |
| <i>Begonia</i> var. Christmas Cheer | <i>Peristrophe angustifolia</i> Nees (? var.
<i>Aurea variegata</i>) |
| <i>Begonia rex</i> Putz. | <i>Petunia</i> hybrids (var. Ruffled giant) |
| <i>Browallia viscosa</i> HBK. | <i>Phlox drummondii</i> Hook. |
| <i>Chrysanthemum frutescens</i> L. | <i>Torenia fournieri</i> Lind. |
| <i>Coleus blumei verschaffeltii</i> Lem. | <i>Verbena</i> sp. (grower's label given as
<i>V. luminosa</i> , but its botanical
identity uncertain) |
| <i>Convolvulus japonicus</i> Thunb. | |
| <i>Cuphea ignea</i> DC. = (<i>Cuphea platy-</i>
<i>centra</i> Lem.) | |
| <i>Fuchsia</i> sp. (probably hybrid) | |

Seven additional ornamentals, however, were found free of this pest; these were:

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| <i>Artemisia stelleriana</i> Bess. | <i>Pelargonium (zonale?)</i> var. Madame
Soleroi |
| <i>Chenopodium ambrosioides</i> L. | <i>Tagetes patula</i> L. (hybrids) |
| <i>Lantana camara</i> L. | <i>Vinca rosea</i> L. |
| <i>Plantago (rugelii?)</i> | |

In the spring of 1934 the soil of these beds was given a treatment of ammonium thiocyanate (NH₄CNS) which, however, proved not to be a satisfactory nematocide.

Tests made during 1937 to determine more accurately the relationship between the root-knot disease and marigolds (covering some 40 horticultural varieties of *Tagetes*) showed that large numbers of root-knot nematode

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larvae enter the roots, but usually fail to develop at all, very few growing to the adult stage and producing eggs. It is not the purpose of the present paper, however, to discuss this relationship of root-knot nematode to marigold roots in any detail, but to report on some taxonomic findings made at that time. As early as 1933 large numbers of a new nematode belonging to the Criconematinae were found living ectoparasitic on these marigold roots. Subsequently this species was described as *Criconemoides mutabile* by A. L. Taylor.¹ In 1934 the situation was the same; again only marigold roots were attacked by this *Criconemoides* species. In 1937 resistance tests with the various marigold varieties against root-knot were made inside one of the above-mentioned greenhouses. Again *C. mutabile* was found on these marigold roots. It appears either that this nematode is a specific parasite of marigolds or that the population under observation represented a strain highly specialized on marigolds. Unfortunately no further attention could be given this host specialization.² For further investigations the question may be raised as to an interrelationship between such apparent host specialization and the length of the buccal stylet of the nemic ectoparasite. Each of the various species of the Criconematinae has a buccal stylet of a fixed length, but this length varies much between the different species. Obviously these nemic ectoparasites in order to reach their food must be able to reach and puncture certain cells in the roots of the host plant. In the present case, the length of the buccal stylet of *C. mutabile* is given as 52 μ . Measurements on roots of the marigolds here involved showed the central cylinder to be 108 to 115 μ from the root surface. *C. mutabile* would therefore not be able to puncture the cells of the axial cylinder of these marigold roots from the surface unless it would penetrate the root ecto- and endodermis with the anterior portion of the body. This seems unlikely on the basis of observations which always show these ectoparasites very loosely attached to the root surface of their host plants. It is therefore assumed that *C. mutabile* feeds on the cells of the endodermis of marigold roots and not on cells of the axial cylinder. These remarks may serve to stimulate further observations and investigations on the host-parasite interrelations in this group of nematodes, a field of study hitherto entirely neglected.

The two new species, the descriptions of which follow, were also found in these marigold roots. In connection with the new *Paraphelenchus* the statement may be made that past observers have paid too little attention to the morphology of the posterior portion of the esophagus, particularly the position of the esophageal glands in the various species of this genus. The same also is true for the representatives of *Aphelenchoides*, the other genus here dealt with. Unfortunately these morphological features are often difficult to observe and analyze.

¹ The genera and species of the Criconematinae a subfamily of the Anguilluliniidae (Nematoda). Trans. Amer. Microscopical Soc. LV (4) : 391-421, 1936.

² In a paper just received (Oliveira, J. M.: Plant-parasitic and free-living nematodes in Hawaii, Occasional Papers of the Bernice P. Bishop Museum, Honolulu, Hawaii, Vol. XV, pp. 361-373, 1940) *C. mutabile* is recorded from Oahu, "about roots of dry land and pineapple field vegetation."

